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ABSTRACT

This study was undertaken to measure the reading, writing, and numeration of 10 and 14 year-old students, and to collect information on teacher perceptions of the nature and extent of any learning difficulties experienced by individual students. A sample of 7,000 students was tested at each of the two age levels. Reading, writing numeration, and word knowledge tests were administered. Findings indicate that Australian children differ little in their ability on tasks of reading comprehension from their age-mates in Britain and the United States, but are marginally inferior to students in New Zealand. In general, the writing of formal letters was poorly performed, and half of the students aged 14 years old were unable to write a minimal letter applying for employment. In numeration, Australian 14-year-olds performed no better than 13-year-olds in the United States. Students aged 10 years could not calculate correctly when using the four operations in a formal way. If a student does not master the basic skills before age 15, when he can legally leave school, he will be disadvantaged for the remainder of his life. (Author/JLL)

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# LITERACY AND NUMERACY IN AUSTRALIAN SCHOOLS

**Interim Report No. 1, 1976.**

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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*The Australian Study of School Performance (ASSP Project) was undertaken to measure the reading, writing and numeration performance of ten and fourteen-year-old students and to collect information on teacher perceptions of the nature and extent of any learning difficulties experienced by individual students. The project was funded by the Educational Research and Developmental Committee (ERDC) with the support of all State and Territory Departments of Education. The Interim Report has been presented by the Australian Council for Educational Research.*

## BACKGROUND AND TERMS OF REFERENCE

### A Concern for Literacy

Across the world, in recent years, there has been a growing concern for the achievement of literacy. The recent reports from Britain – *A Language for Life* (Bullock, 1975) and from the United States – *Towards a Literate Society* (Carroll and Chall, 1975) reveal an awareness that there are substantial numbers of adults in these countries who cannot read. The reports of the Australian Schools Commission (Karmel, 1973 and McKinnon, 1975) have acknowledged as a basic value that all children (primary and secondary) should attain minimum standards of competence for life in a modern, democratic, industrial society. They do not acknowledge that a problem currently exists within Australian schools with regard to the achievement of literacy.

By 1933 it was argued that under the system of compulsory education the number of persons who reached maturity without being able to read or write in any language was extremely small. But the influx of non-English speaking migrants into Australia after 1945 may have led to a deterioration in the situation, and it would now appear meaningful to ask again, after an interval of 50 years, whether in Australia today there are significant numbers, even though they may be only a small percentage of the total, who are not able to read and write in English.

If, after nine years of compulsory schooling, students were unable to read and write effectively, it would be unlikely that they would acquire these skills, which are of importance in our society, soon after leaving school.

### The Aims of the Survey

1. To identify specific tasks and competencies associated with the basic skills of literacy and numeracy which children are expected to possess to enable them to participate successfully in the work of the school and to live and work effectively in Australian society.
2. To prepare appropriate performance tests to measure levels of competence in the basic skills of reading, writing and numeration.
3. To estimate with a high level of accuracy for Australia as a whole, and for each State in particular, the number of children who are failing to attain basic skills of literacy and numeracy as assessed by the tests of reading, writing and numeration.
4. To specify relationships between various other factors (age, grade, type of community, specific learning difficulties, ethnic origin, language of home, socio-educational level and sex) and the attainment of specific levels of competence in the basic skills of reading, writing and numeration.

## WHAT IS LITERACY?

An *operational* definition of literacy is the completion of six years of schooling.

An *alternative* definition, based on achievement, is the level of achievement reached by the average child at the beginning of the fourth grade of schooling.

The definition used by the compilers of the report is the one submitted by Unesco to the U.N. General Assembly in 1963:

*A person is literate when he has acquired the essential knowledge and skills which enable him to engage in all those activities in which literacy is required for effective functioning in his group and community, and whose attainments in reading, writing and arithmetic make it possible for him to continue to use these skills towards his own and the community's development and for active participation in the life of his country.*

## HOW WAS LITERACY MEASURED?

In this study a decision was made at the outset to avoid the use of the readily available tests of reading and arithmetic as they had been constructed as normative instruments. Those approaches to assessment which employed the average level of performance of an age or grade group were also rejected.

### The Writing and Trial of the Items

It was argued that a speeded test was inappropriate for testing literacy or numeracy even for the slower students. Where possible, students were given separate time units for each section of the test.

Students were asked to record the response *beside each question* on the test booklet which imposed a heavy burden of hand scoring the tests during the processing of the data.

Wherever possible, pictorial or diagrammatic stimulus material was used to simplify the task of responding for the student who was not a strong reader.

### The Reading Tests

The tests for both the ten- and fourteen-year-olds were made up of five sections. Each section was timed and overall time allowed was approximately thirty minutes.

*Section 1*

This section consisted of the alphabet with six letters missing. Error types in completing the alphabet were recorded in addition to the number of letters correct.

*Section 2*

Five simple sentences, each with four associated pictures, were presented. Students were asked to indicate which of the pictures was described by the sentence. This section measured a basic level of reading: sentences ranged from 'The boy saw a fish in the fish bowl' to 'The woman was surprised to see the horse inside'. Sentences and pictures were the same for the tests at both levels.

*Section 3*

To test linguistic competence, students were asked to complete seven sentences by selecting the correct word or phrase from three alternatives offered in each case. For example, one sentence was:

| | | |
|---|---|---|
| | □ is | |
| The news | □ were | bad today. |
| | □ are | |

It may be that children from non-English backgrounds have particular difficulty with these types of items. Another item in this group was associated with word order. For example,

| | | |
|---|---|---|
| | □ | in the afternoon study never. |
| The children | □ | study in the afternoon never. |
| | □ | never study in the afternoon. |

The items in this section were the same for both reading tests.

*Section 4*

This section consisted of a reading comprehension exercise using different passages and questions for each test. As the exercises were taken from the 1970 IEA tests, comparisons of the performance of Australian students with those in other English-speaking countries will be possible.

*Section 5*

A newspaper, especially prepared for the reading tests, was given to students who were required to answer questions about articles in it. In some cases students simply had to find a particular piece of news, in other cases they had to find specific information in an article, and for a few questions, interpretation of the meaning of words or phrases was required. For the ten-year-old test the newspaper was a double-sided tabloid sheet; for the fourteen-year-old test, two double-sided tabloid sheets were used. Thus two pages of the newspaper and some questions asked were common to both tests.

### The Writing Tests

Students require several minutes to complete an item on a writing test. Consequently only a few objectives could be measured in a writing test of about 30 minutes duration. It was considered that 13 or 14 writing objectives identified should be measured for both samples and this was achieved by having three different tests (forms A, B and C) at both the 10- and 14-year-old levels. The resultant reduction in sample size from about 7000 to about 2300 at each level was accepted as a necessary corollary of testing all the key writing objectives in a 30 minute test.

Items varied from the utilitarian completion of a form, through writing informal and formal letters, to asking students to write about themselves. These latter items required the ten-year-old children to write about how they have fun with their friends and fourteen-year-olds to write about their experiences of being alone. Photographs and other stimulus materials were used in an effort to attract and sustain the interest of students.

Marking of two types was used in evaluating answers to the writing test. Some items were capable of objective marking for specific requirements, e.g. the form completion and transcription exercises. Other items were impression marked on general writing ability, e.g. the 'write about yourself' items. Some items were marked by both methods independently, e.g. some of the reports and some of the letters.

### The Numeration Tests

Both the ten- and fourteen-year-old numeration tests contained 33 items of which a small number were multiple choice and the remainder required students to calculate an answer and construct a response. Students had 30 minutes to complete the numeration test and, with few exceptions, this was ample. Many of the numeration test items are based upon one type of arithmetical operation. The results of the four subtests so formed will be of interest. The items were designed to be as relevant and as meaningful as possible and this was done by using illustrations and other diagrammatic stimulus material.

### The Word Knowledge Tests

A 10 minute word knowledge test was also administered to students. The test consisted of 40 pairs of words and students were asked to identify whether each pair of words had approximately the same or opposite meanings. The tests, which differed for the ten- and fourteen-year-old students, were taken from the 1970 IEA survey. Performance on the word knowledge tests will be used as a reference variable to relate the samples of students in this study to each other and to the samples used in the IEA study.

### The Student Questionnaire

This questionnaire sought some general information about each student such as family size, whether he had a twin, number of schools attended and other information specifically related to migrancy, e.g. country of birth of himself and his parents, years lived in Australia and some details of languages used in the home.

Teachers supervising the completion of this questionnaire were asked to give any assistance needed to have it completed accurately—even to the extent of completing it themselves from oral answers obtained from students if necessary.

### The Teacher Questionnaire

A teacher who knew each student well, in primary schools normally the class teacher, was asked to complete a questionnaire consisting of one double-sided sheet on various aspects related to the student's attendance, performance in reading and number, relationships with peers, sickness or other physical disabilities, understanding and use of language, and race. Most of the questions were concerned with the teacher's perceptions of the student's learning or social problems. In some cases these perceptions will be compared with actual student performance on the tests, in other cases they will be used as variables which assist in an explanation of student performance.

## SCOPE

### The Population and the Samples

The age levels selected were:

*Age 10.00 to 11.00 years,* during the middle primary school period where the basic skills of literacy and numeracy, which influence to a major extent all further learning, should have been acquired,

*Age 14.00 to 14.11 years,* during the middle secondary school stage at a level immediately prior to the end of the period of compulsory schooling, where *all* students were still at school.

A complication rose in the Northern Territory. In 1975 schooling in N.T. was still disrupted by the effects of the cyclone which devastated Darwin on 25 December 1974.

The schools were classified for the investigation:

1. Government metropolitan schools
2. Government non-metropolitan primary/secondary schools
3. Government non-metropolitan schools
4. Catholic Systemic metropolitan schools
5. Catholic Systemic non-metropolitan schools
6. Independent Catholic metropolitan schools
7. Independent Non-Catholic metropolitan schools
8. Independent Catholic non-metrolopolitan schools
9. Independent Non-Catholic non-metropolitan schools
10. Aboriginal schools (Northern Territory only)
11. Excluded schools (not containing students in normal schooling)

Sampling was first by schools and then by students within schools. A maximum of 7000 students were tested at each of the two age levels. With samples of this size it was expected that errors of the estimates for means and proportions would be approximately 3 per cent of a student standard deviation.

Response rate by both schools and students was highly satisfactory, in excess of 90 per cent for each State, but below the desired value for the A.C.T. and N.T.

## FINDINGS

The interim report sought to examine the extent to which 10- and 14-year-old students in Australian schools were able to read, write and calculate effectively. It was undertaken at a time when there was increasing public concern for quality and standards in Australian education not only in the popular press and television debates but also in scholarly writing (Crittendon and D'Cruz, 1976). In the selection of items and exercises for assessing performance on essential tasks, consideration was taken of the skills that an individual at these age levels needs not only to participate fully in the activities of Australian society, but also to continue to take part successfully in school learning for his own future development.

### Reading

There is important evidence from the data collected in this survey that there are no marked differences in the level of performance of Australian students in comparison with students in Britain and the United States.

There is, however, some evidence to suggest that Australian 14 year-old students have done less well than their age mates in New Zealand on a simple exercise assessing reading comprehension. Yet they share a lower level of achievement in reading comprehension, compared to 14-year-old students in New Zealand, with students in other countries in the Western World (Thorndike, 1973).

There is clearly no evidence from this investigation to decry the level of achievement in Australian schools.

Nevertheless, the evidence should lead to concern that

in normal schools in this country there are large numbers of 10-year-old students, approximately 3 per cent of the age cohort and amounting to 7500 students, who appear unable to read very simple sentences correctly. It is estimated that approximately one student per classroom has not achieved this most elementary level of reading performance by the age of 10 years.

At the 14-year-old level our estimates indicate that there are approximately 0.8 per cent of the age cohort or 2000 students who have not mastered the simplest skills of reading.

The survey suggests that unless students have reached this threshold level of achievement in reading by the ages of 10 and 14 years they are unable to obtain the practice necessary for improvement and are severely handicapped. In addition, these estimates excluded students in special schools (3870 in Queensland in a total primary/secondary State enrolment of 333 351, November 1975).

In the exercises involving reading comprehension of continuous prose, similar to that contained in normal school texts and reference books, approximately 25 to 30 per cent of the students in both samples were unable to provide correct answers to the questions asked. Performance was not judged in absolute terms or with respect to the norms obtained from standardised tests but compared performance with that of students in other English speaking countries.

The evidence suggests that they differ little in their ability on tasks of reading comprehension from their age-mates in Britain and the United States in 1970, but were probably marginally inferior to students in New Zealand.

### Writing

The tests used to assess students' writing provided evidence not only of performance in the basic skills of writing, which are associated with literacy, but also of performance in more creative and imaginative writing tasks.

The performance of the 14-year-old students was much higher than that of the 10-year-old students on similar or identical tasks tested at both age levels. For example, whereas approximately one-tenth of the 14-year-olds were unable to meet the essential requirements of recording a telephone message, more than a quarter of the 10-year-olds were unable to do so.

Another simple task was writing a personal letter. While 76% of 10-year-old students and 92% of 14-year-old students completed the task satisfactorily, some students wrote little. It is suggested that some students have not attained even the very lowest levels of performance in writing.

On a more complex task, involving writing a letter of application for employment, only 50% of the 14-year-old students were able to carry out the task satisfactorily.

It is not surprising that students at both age levels had less difficulty meeting the requirements of a personal letter to a friend than in including the essential components of a more formal letter requesting information.

The evidence available at this stage of the project suggests that some important and quite specific writing tasks, such as the writing of letters for a defined purpose, have not been mastered by large numbers of students.

At the 10-year-old level on a transcription exercise less than 20% of the sample were able to complete a simple transcription.

In discussing standards of literacy in Australian schools, it is necessary to direct attention more to the serious problems of a minority of students than to the satisfactory performances of the majority. Some aspects of the completion of a form were not understood by substantial numbers of students, although the proportions not meeting requirements were small in most cases.

In general, the writing of formal letters was poorly done and perhaps the most striking result of the various writing tasks was that half of the students aged 14 years were unable to meet the requirements of a letter applying for employment.

## NUMERATION

Every school student in Australia is expected to master the basic skills involved in manipulating numbers to enable him to participate successfully in the work of the school and to live and work effectively in Australian society. Items in the Numeration Tests were categorised on the three dimensions of content, ability required and usage to which the skill could be put.

With very few exceptions students in both samples attempted every item in the Numeration Test. The exceptions were students from aboriginal schools in the Northern Territory.

The most disturbing finding has been that 4% of the 14-year-olds did not multiply seven by six correctly and 8% did not divide 56 by seven correctly. If we accept that not all students should know their number facts by the age of 10 years, although some would question the wisdom of this, then we must surely accept that four years later they should know these basic facts so they can carry out simple calculations.

The evidence has indicated that among the 14-year-old students, many of whom would shortly be leaving school, there are large numbers, estimated at 10 000 who do not know simple subtraction and multiplication facts, and an estimated 20 000 who do not know simple division facts.

The fact, too, that Australian 14-year-olds performed no better than 13-year-olds in the United States is a matter of concern. The evidence shows that 10-year-old students could carry out simple calculations involving money correctly, but did not know their number facts and could not calculate correctly using the four operations in a formal way. This seems to indicate that what they learnt outside the school was more effectively mastered than what they learnt within.

The consequences of inadequate mastery of school learning were apparent at the 14-year-old level where substantial proportions were unable to perform successfully slightly more complex calculations involving money. If these tasks have not been mastered at school before a student were able to leave at the age of 15 years, he would be very seriously disadvantaged for the remainder of his life.

*It has not been the purpose of this Interim Report to derive specific recommendations for educational practices in Australia. What the project has achieved is the identification of the tasks which are important for literacy and numeracy and the estimation, for Australia as a whole, of the proportions and numbers of students aged 10 and 14 years who are unable to complete these tasks successfully. Simple solutions to the problems do not exist. If solutions are to be found, they must involve the health and welfare of Australian children as well as the learning and teaching practices in all Australian classrooms.*